CLAIMS

I/We claim:

[c1] 1. An aircraft system, comprising:

an aircraft antenna that includes:

a flexible substrate material; and

at least one flexible conductive material positioned adjacent to at least one surface of the substrate material, wherein at least portions of the flexible substrate material and the conductive material are disposed in a generally cylindrical manner about an elongated axis.

[c2] 2. The system of claim 1, further comprising at least one circuit element formed in the at least one conductive material.

[c3] 3. The system of claim 1, further comprising at least one conductive lead formed in the at least one conductive material.

[c4] 4. The system of claim 1, further comprising a first conductive lead and a second conductive lead formed in the at least one conductive material, and wherein the first conductive lead and second conductive lead are electrically isolated from each other.

[c5] 5. The system of claim 1 wherein the substrate material and the conductive material are rolled as a unit about the elongated axis to form a closed cylinder.

[c6] 6. The system of claim 1 wherein the substrate material and the conductive material are rolled as a unit about the elongated axis to form a closed

cylinder, and wherein the closed cylinder includes a first antenna and a second antenna.

[c7] 7. The system of claim 1 wherein the at least one conductive material is integrally attached to the substrate material.

[c8] 8. The system of claim 1 wherein the flexible substrate material includes a flexible, low dielectric insulator.

[c9] 9. The system of claim 1 wherein the at least one flexible conductive material includes a low resistivity conductor.

[c10] 10. The system of claim 1, further comprising an aircraft, and wherein the antenna is carried by the aircraft.

[c11] 11. An aircraft system, comprising:

an aircraft antenna that includes:

a flexible substrate material having a first surface and a second surface opposite the first surface;

a first conductive layer positioned adjacent to the first surface of the substrate; and

a second conductive layer positioned adjacent to the second surface of the substrate, wherein at least portions of the flexible substrate material, the first conductive layer, and the second conductive layer are rolled about an axis into an at least partially cylindrical shape elongated along the axis.

[c12] 12. The system of claim 11, further comprising at least one circuit element formed in at least one of the first and second conductive layers.

[c13] 13. The system of claim 11, further comprising at least one conductive lead formed in the second conductive layer.

[c14] 14. The system of claim 11 wherein at least portions of the substrate material, the first conductive layer, and the second conductive layer are rolled about the axis to form a closed cylinder.

[c15] 15. The system of claim 11 wherein the at least portions of the substrate material, the first conductive layer, and the second conductive layer are rolled about the axis to form a closed cylinder, and wherein the closed cylinder includes a first antenna and a second antenna.

[c16] 16. The system of claim 11 wherein the flexible substrate material includes a flexible, low dielectric insulator.

[c17] 17. The system of claim 11 wherein at least one of the first and second conductive layers includes a low resistivity conductor.

[c18] 18. The system of claim 11, further comprising a support material disposed at least partially within an interior surface of the cylinder formed by rolling the at least portions of the substrate material and the first and second conductive materials about an axis.

[c19] 19. An aircraft antenna assembly, comprising:

a flexible substrate material substrate having a first side and a second side opposite the first side;

a first conductive layer positioned adjacent to the first side of the substrate, the first conductive layer including at least one ground portion coupleable to ground;

a second conductive layer positioned adjacent to the second side of the substrate, the second conductive layer including a transmitter portion

and a receiver portion electrically isolated from the transmitter portion, the transmitter portion being positioned to be electrically coupled to a signal transmitter, the receiver portion being positioned to be electrically coupled to a signal receiver; and

at least one antenna in electrical communication with at least one of the transmitter portion and the receiver portion, the at least one antenna being formed from at least a portion of the first and second conductive layers.

[c20] 20. The antenna assembly of claim 19 wherein the at least one antenna includes a generally cylindrical dipole antenna formed by rolling at least a portion of the substrate material, the first conductive layer, and the second conductive layer about an axis into a generally cylindrical shape.

[c21] 21. The antenna assembly of claim 19 wherein the first conductive layer includes at least one antenna overlap connector and the second conductive layer includes at least one antenna conductor portion, and wherein at least a portion of the substrate material, the first conductive layer, and the second conductive layer are rolled about an axis until the at least one antenna overlap connector contacts the at least one antenna conductor portion, forming a generally cylindrical antenna.

[c22] 22. The antenna assembly of claim 19 wherein the at least one antenna includes a first antenna and a second antenna, the first antenna being electrically coupled to the transmitter portion and the second antenna being electrically coupled to the receiver portion, and wherein the first and second antennas are electrically isolated from each other.

[c23] 23. The antenna assembly of claim 19, further comprising a third conductive layer positioned adjacent to the second conductive layer, the third

conductive layer being electrically coupled to the first conductive layer and electrically isolated from the second conductive layer.

[c24] 24. The antenna assembly of claim 19 wherein the at least one ground portion includes a first ground portion and a second ground portion, the first ground portion positioned to provide electrical shielding for the transmitter portion, the second ground portion positioned to provide electrical shielding for the receiver portion.

[c25] 25. An aircraft antenna assembly, comprising:

a flexible substrate material having a first surface and a second surface opposite the first side;

a first conductive layer positioned adjacent to the first surface of the substrate material, the first conductive layer including at least one ground plane and at least one antenna overlap connector;

a second conductive layer positioned adjacent to the second surface of the substrate material, the second conductive layer including at least one antenna conductor portion, a transmitter portion, and a receiver portion;

a third conductive layer positioned adjacent to the second conductive layer, the third conductive layer being electrically coupled to the first conductive layer and electrically isolated from the second conductive layer; and

at least one antenna in electrical contact with at least one of the transmitter portion and the receiver portion, the at least one antenna including at least a portion of the substrate material, the first conductive layer, and the second conductive layer rolled about an axis with the at least one antenna overlap connector in contact with the at least one antenna conductor portion.

[c26] 26. The antenna assembly of claim 25 wherein the at least one antenna includes an at least generally cylindrical dipole antenna.

[c27] 27. The antenna assembly of claim 25 wherein the at least one antenna includes a first antenna and a second antenna, the first antenna being electrically coupled to the transmitter portion and the second antenna being electrically coupled to the receiver portion.

[c28] 28. The antenna assembly of claim 25, further comprising a third conductive layer positioned adjacent to the second conductive layer, the third conductive layer being electrically coupled to the first conductive layer and electrically isolated from the second conductive layer.

[c29] 29. The antenna assembly of claim 25 wherein the at least one ground plane includes a first ground plane and a second ground plane, the first ground plane positioned to provide electrical shielding for the transmitter portion, the second ground plane positioned to provide electrical shielding for the receiver portion.

[c30] 30. The antenna assembly of claim 25 wherein the transmitter portion includes a transmitter module coupled to a transmitter filter, and wherein the transmitter module includes an 800 mW video transmitter and the transmitter filter includes a 2400 MHz bandpass filter.

[c31] 31. The antenna assembly of claim 25 wherein the receiver portion includes a receiver module coupled to a receiver filter, and wherein the receiver module includes a 900 MHz modem.

[c32] 32. A aircraft system, comprising:

an unmanned aircraft including a lifting surface having a winglet;

an antenna package releasably positioned inside the winglet; and

at least one antenna releasably positioned in the antenna package.

[c33] 33. The system of claim 32 wherein the at least one antenna includes a generally cylindrical dipole antenna.

[c34] 34. The system of claim 32 wherein the at least one antenna includes:

a flexible substrate material; and

at least one flexible conductive material positioned adjacent to at least one surface of the substrate material, wherein at least portions of the substrate material and the conductive material are rolled about an axis into an at least partially cylindrical shape.

[c35] 35. The system of claim 32 wherein the antenna package includes a receptacle portion having a flexible, undersized receptacle positioned to receive the antenna, and a cover portion coupled to the receptacle portion and movable relative to the receptacle portion between a closed position and an open position, the antenna being accessible when the cover portion is in the open position.

[c36] 36. A method of forming an aircraft antenna, comprising:

providing a flexible substrate material having a first surface, a second surface facing opposite the first surface, and at least one flexible conductive material adjacent to at least one surface of the substrate material; and

rolling at least a portion of the substrate material and at least a portion of the conductive material as a unit about an axis to form an at least partially cylindrical antenna elongated along the axis.

[c37] 37. The method of claim 36, further comprising forming at least one circuit element in the at least one conductive material.

[c38] 38. The method of claim 36, further comprising forming at least one conductive lead in the at least one conductive material.

[c39] 39. The method of claim 36, further comprising forming a first conductive lead and a second conductive lead in the at least one conductive material, and wherein the first conductive lead and second conductive lead are electrically isolated from each other.

[c40] 40. The method of claim 36 wherein rolling at least a portion of the substrate material and at least a portion of the conductive material as a unit about an axis includes forming an antenna shaped as a closed cylinder elongated along an axis.

[c41] 41. The method of claim 36 wherein:

the flexible substrate material has a first flexible conductive layer adjacent to the first surface and a second flexible conductive layer adjacent to the second surface; and

rolling at least a portion of the substrate material and at least a portion of the conductive material as a unit includes rolling at least a portion of the substrate material and at least a portion of the first and second conductive layers as a unit about an axis to form an at least generally cylindrical antenna elongated along the axis.

[c42] 42. The method of claim 36 wherein:

the flexible conductive material has a first flexible conductive layer adjacent to the first surface and a second flexible conductive layer adjacent to the second surface, the first conductive layer including at least one ground portion, the second conductive layer including a transmitter portion and a receiver portion; and

rolling at least a portion of the substrate material and at least a portion of the conductive material as a unit includes rolling at least a portion of

the substrate material and at least a portion of the first and second conductive layers as a unit about an axis to form at least one generally cylindrical antenna elongated along the axis, the at least one antenna being in electrical communication with at least one of the transmitter portion and the receiver portion.

[c43] 43. The method of claim 36 wherein providing the flexible substrate material includes providing a flexible substrate material having a first flexible conductive layer adjacent to the first surface, a second flexible conductive layer adjacent to the second surface, and a third conductive layer adjacent to the second conductive layer, the third conductive layer being electrically coupled to the first conductive layer and electrically isolated from the second conductive layer.

[c44] 44. The method of claim 36 wherein:

providing the flexible substrate material includes providing a flexible substrate material having a first flexible conductive layer with at least one antenna overlap connector adjacent to the first surface and a second flexible conductive layer with at least one antenna conductor portion adjacent to the second surface of the substrate material; and

rolling at least a portion of the substrate material and at least a portion of the conductive material as a unit about an axis includes rolling at least a portion of the substrate material and at least a portion of the first and second conductive layers as a unit about the axis until the at least one antenna overlap connector contacts the at least one antenna conductor portion to form at least one generally cylindrical antenna.

[c45] 45. The method of claim 36 wherein forming an at least partially cylindrical antenna elongated along the axis includes forming a first antenna and a

second antenna, the first antenna being electrically isolated from the second antenna.

[c46] 46. The method of claim 36, further comprising forming at least one ground portion being positioned to provide electrical shielding for the at least partially cylindrical antenna elongated along the axis.

[c47] 47. The method of claim 36, further comprising installing the antenna in a winglet of an unmanned aircraft.

[c48] 48. A method of forming an aircraft antenna, comprising:

providing a flexible substrate material having a first surface, a second surface opposite the first surface, a first conductive layer adjacent to the first surface and a second conductive layer adjacent to the second surface, the first conductive layer including at least one ground plane and at least one antenna overlap connector, the second conductive layer including at least one antenna conductor portion, a transmitter portion, and a receiver portion; and

forming at least one generally cylindrical antenna by rolling at least a portion of the substrate material, the first conductive layer, and the second conductive layer as a unit about an axis until the at least one antenna overlap connector contacts the at least one conductor portion.

[c49] 49. The method of claim 48, further comprising positioning a third conductive layer adjacent to the second conductive layer, the third conductive layer being electrically coupled to the first conductive layer and electrically isolated from the second conductive layer and the at least one overlap connector.

[c50] 50. The method of claim 48 wherein forming the at least one generally cylindrical antenna includes forming a first antenna and a second antenna, the first

antenna being electrically coupled to the transmitter portion and the second antenna being electrically coupled to the receiver portion.

[c51] 51. A method of assembling an aircraft system, including:
removably installing at least one antenna in an antenna package;
removably installing the antenna package in a winglet of a lifting surface of an unmanned aircraft; and
electrically coupling the antenna with an electrical system of the aircraft.

[c52] 52. The method of claim 51, further comprising removably installing a transmitter and a receiver in the antenna package, and wherein the at least one antenna is electrically coupled to at least one of the transmitter and receiver.

[c53] 53. The method of claim 51, further comprising removably installing a transmitter and a receiver in the antenna package, and wherein removably installing the at least one antenna includes removably installing a first antenna and a second antenna, the first antenna being electrically coupled to the transmitter and the second antenna being electrically coupled to the receiver.

[c54] 54. The method of claim 51 wherein removably installing at least one antenna in an antenna package includes removably forcing the antenna into an undersized receptacle of the antenna package.